

Castleton Road and Sharon Amity Road Evaluation Report

by Charlotte Department of Transportation

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INTRODUCTION

The City of Charlotte Department of Transportation (CDOT) conducted a study at the intersection of North Sharon Amity Road and Castleton Road and surrounding intersections. The purpose of this study was to identify and evaluate citizens' concerns.

COMMUNITY ENGAGEMENT

City staff met with community leaders one on one to discuss their safety concerns at the intersection of Castleton Road and North Sharon Amity Road. At this meeting community leaders expressed how recent collisions at the intersection had raised community concern of the intersection's safety. The community leaders indicated Castleton Road is not clearly visible to motorists traveling along North Sharon Amity Road and expressed concern with limited sight distance at Castleton Road due to overgrown bushes. In addition, they noted motorist speeding on North Sharon Amity Road was an issue. The community leaders requested a traffic signal be installed at the intersection to address their safety concerns.

A public meeting was held with the community for the City to hear citizens' concerns and to notify them of the City's plan to evaluate the intersection. At the meeting residents expressed the same concerns the community leaders had previously voiced to City staff, including residential streets are not visible, limited sight distance from residential streets and motorists speed on North Sharon Amity Road. Many residents expressed desire for a traffic signal at Castleton Road and requested the City to evaluate the study area for possible solutions.

EXISTING CONDITIONS

The study area is located along North Sharon Amity Road at the intersections of Castleton Road and Craig Avenue. At this location, North Sharon Amity Road is a four-lane, undivided road and does not provide a separate left-turn storage lane for turning vehicles at Castleton Road or Craig Avenue. North Sharon Amity Road is classified as a major thoroughfare and it carries approximately 20,000 vehicles per day. The posted speed is 35 miles per hour with an 85th percentile speed of 42 miles per hour. The 85th percentile speed term means the majority of traffic is traveling at that speed or less and is a common method for reporting speeds. Sight distance is limited for simultaneous, opposing left turns from North Sharon Amity Road due to the lack of offset for the turns. Simultaneous left turns may limit visibility of the outside lanes; however, this condition is common with any 4-lane undivided facility.

Castleton Road is a two-lane undivided road and classified as a local residential street. The posted speed is 25 miles per hour and has a traffic volume of approximately 400 vehicles per day. Castleton Road is stop-sign controlled at its intersection with North Sharon Amity Road. There were no sight distance limitations for the left, right or through movements from Castleton Road once vegetation was removed.

Craig Avenue is a two-lane undivided road with speed humps and classified on the west side of North Sharon Amity Road as a collector street. East of North Sharon Amity Road, Craig Avenue is classified as a local street. Traffic volume on the collector portion is 2,000 vehicles per day with a posted speed limit of 30 miles per hour. Craig Avenue is stop-sign controlled at its intersection with North Sharon Amity Road. An existing curve on North Sharon Amity Road limits sight distance for vehicles turning left and right from eastbound Craig Avenue. An overhead caution flasher is located at this intersection due to limited sight distance created by the curve on North Sharon Amity Road. No sight distance issues were noted for westbound Craig Avenue movements.

CRASH ANALYSIS

CDOT prepared the *North Sharon Amity Road and Castleton Road Safety Report* in January 2013 and provided it to City Council, the City Manager's Office and several citizens. The citizens attended City Council meetings in November 2012 and January 2013 to express safety concerns related to the North Sharon Amity Road/Castleton Road intersection. The *Safety Report* included crash analysis for the four-year period from 2009 through 2012 for the North Sharon Amity Road intersections at Castleton Road and Craig Avenue. The crash analysis provided in this Evaluation Report looks at the most recent five-year history from 2010 through 2014.

On average, there are more than 19,700 motor vehicle crashes on Charlotte streets. That number has been on the rise in the last two years. However, the crash numbers at the intersections of North Sharon Amity Road/Castleton Road and North Sharon Amity Road/Craig Avenue have not seen increases.

There have been a total of 12 crashes in approximately five years (January 2010 – February 2015) at North Sharon Amity Road and Castleton Road. There is an average of 2.4 crashes annually. There is no predominant pattern of crashes. Of the 12 crashes, four (33.3%) involved no injury, seven (58.3%) involved injury and one (0.08%) resulted in a fatality. The fatal crash occurred in September 2013.

Intersecting Road	Total Crashes for 5-year period	Non-Injury	Injury	Fatal	Average Annual Number of Crashes	Crash Rate (per million vehicle miles)
Castleton Road	12	4	7	1	2.4	0.34
Craig Avenue	7	3	4	0	1.4	0.20

There have been a total of seven crashes in approximately five years (January 2010 – February 2015) at North Sharon Amity Road and Craig Avenue. There is an average of 1.4 crashes annually. There is no

predominant pattern of crashes. Of the seven crashes, three (43%) involved no injury and four (57%) involved injury.

With more than 20,000 intersections in the City, CDOT has developed tools to focus efforts on the most unsafe intersections. One of the tools is the High Accident Location (HAL) list. The HAL is based on a crash rate which is a mathematical formula that accounts for total numbers of collisions and intersection traffic volumes. There are currently 66 ranked intersections on the HAL and locations with a crash rate at 1.20 or higher are included. The intersection of North Sharon Amity Road/Castleton Road has a crash rate of 0.34 crashes per million vehicle miles traveled, while North Sharon Amity Road/Craig Avenue had a crash rate of 0.20 crashes per million vehicle miles traveled. Neither of these intersections was included on the HAL.

ALTERNATIVE ANALYSIS

At the community's request, CDOT evaluated the study area for potential improvements to the intersections of Castleton Road and Craig Avenue along North Sharon Amity Road. These alternatives evaluate the impact of improvements as it relates to crashes, safety, mobility and vehicle speeds. In addition, property impacts, project costs and project duration were considered. Summary Tables detailing analysis of each alternative are included in the appendices. Note, duration of implementation does not account for time associated with funding and denotes time required to complete project once funding is secured.

ALTERNATIVE 1: Signal at North Sharon Amity Road

Widen North Sharon Amity Road to northbound and southbound left turn lanes at Castleton Road **or** Craig Avenue with a traffic signal.

CDOT policy requires designated left-turn lanes at all new traffic signal locations. The reason for this policy is that without the addition of left turn lanes the frequency of crashes can increase with the addition of a traffic signal. The addition of turn lanes provide many benefits by separating left-turning traffic from through movement traffic. Designated turn lanes provide storage for motorists waiting to turn and space to decelerate outside of the through lanes. When a signalized intersection has designated left turn lanes, the signal can be programmed to allow left-turn movement without the conflict of oncoming through traffic.

The initial citizen request was for a traffic signal at the intersection of North Sharon Amity Road and Castleton Road. Craig Avenue was also evaluated based on roadway network connectivity to Castleton Road, higher roadway classification as a collector street and presence of existing traffic calming features. Due to Craig Avenue's proximity to Castleton Road and better overall connectivity, Craig Avenue would likely be chosen as the alternate route if a signal were to be installed at Castleton Road. Castleton Road does not have sight distance limitations as compared with Craig Avenue, therefore a signal at Craig Avenue would better serve traffic using the signal and those drivers who switch to alternate routes to avoid the minor road delays that are common in these types of applications. A traffic signal at Craig

Avenue would improve safety for vehicles turning left from Craig Avenue onto North Sharon Amity Road because of the existing limited sight distance for this turning movement.

The signal warrant analysis does not indicate a traffic signal at either location is justified based on traffic volumes, including crash history.

Signal Warrants Analysis Results

	Castleton Road	Craig Avenue
<i>Condition Evaluated</i>		
Traffic Volume Threshold	NO	NO
Crash Experience Threshold	NO	NO
Street Connectivity	YES	YES
Pedestrian Connectivity (sidewalk)	NO	YES
Constrained Sight Distance for Turning Traffic	NO	YES
Presence of Left Turn Lanes	NO	NO

ALTERNATIVE 2: Restricted Access

Restrict access at the intersection of North Sharon Amity Road and Castleton Road to prohibit left turns from Castleton Road and North Sharon Amity Road by signing and/or close the access point. Closing access is typically implemented with the addition of a median.

The installation cost of a median would be higher than signage alone. Widening would be required to install a 2' or greater width median on North Sharon Amity Road and require right-of-way acquisition and utility relocations. Installation of sign restrictions only has no impact on adjacent properties. A median provides a physical barrier that is more successful at restricting movement than signage alone. Costs and property impacts vary depending on median size and material.

It is important to evaluate and understand the tradeoffs before restricting access because it changes how motorists are able to use the existing street network. Restricting left turns at the intersection will eliminate left turn and angle type crashes, but turning movements divert to other locations, potentially creating new or increased safety problems at other intersections. Improvements would likely be needed to accommodate u-turning movements created by restricting access. Another tradeoff to consider is during off-peak times when left-turn movements are easier to make, this opportunity will be removed with the restriction.

The crash analysis does not support restricting access at the intersection of Castleton Road and North Sharon Amity Road. Since the intersection does not warrant restricting access and there are many tradeoffs to consider, CDOT would not pursue restricting access without community support.

ALTERNATIVE 3: Neighborhood Connectivity

Provide street connectivity at Doncaster Drive or Shady Bluff Drive.

Connectivity relates the number of intersections along a segment of streets and how the entire area is connected to the roadway network. Good street connectivity provides more options to users and can reduce traffic congestion. A connection at either of these locations will greatly improve neighborhood connectivity, provide connectivity between North Sharon Amity Road and Rama Road and provide access to a traffic signal at Addison Drive. While this provides motorists more options, some will continue to use Castleton Road to make left turns and this alternative does not provide any improvements to the intersection.

Community support is important when new street connections are made. Street connections are difficult to implement between residential neighborhoods unless there is a perceived benefit to both communities. Either location would require significant right-of-way acquisition and stream mitigation.

The crash analysis does not warrant pursuing a new street connection at Doncaster Drive or Shady Bluff Drive. When compared to other alternatives, this alternative does not directly address the community's concerns as well as other alternatives with comparable cost and impacts.

ALTERNATIVE 4: Modern Roundabout

Convert existing North Sharon Amity Road and Craig Avenue intersection to a two-lane roundabout.

Roundabouts are designed to direct traffic flow continuously in one direction around a central island making an intersection safer and more efficient for drivers. Traditional intersections that are converted to roundabouts typically see a significant reduction in the severity of accidents. The vehicle movements in a roundabout reduce the likelihood of head-on collisions and motorist speeds are reduced as they enter the roundabout.

The crash analysis does not support converting the intersection to a roundabout. Required improvements would require right-of-way acquisition, utility relocations and significant impact to adjacent properties.

ALTERNATIVE 5: North Sharon Amity Road Conversion

Evaluated converting existing North Sharon Amity Road from a four-lane undivided roadway segment to a three-lane segment consisting of two through lanes and a center two-way left turn lane. A road conversion can be a low cost safety solution, particularly in this case where only pavement marking modifications are required and can be done in conjunction with resurfacing.

North Sharon Amity Road's current traffic volumes near the suggested maximum ADT (Average Daily Traffic) for roadway conversions. If the ADT is near the upper limits, extensive analysis should be conducted to determine if a road conversion is operationally feasible. This would include evaluating peak hour volumes by direction and considering signal spacing, turning volumes at intersections and other access points. In addition, the at-grade railroad crossing between Craig Avenue and Monroe Road

must be considered. Vehicles queued at an at-grade rail crossing will need to be served by one through lane if converted, potentially resulting in queues that are twice as long.

Side streets can experience longer delays during peak-hour travel due to fewer gaps in traffic. During non-peak hour travel, left turns from side streets are easier to make because there are fewer travel lanes to cross.

Note: North Sharon Amity Road is currently part of a corridor study to determine the feasibility of a road conversion. The crash analysis does not warrant a road conversion; however CDOT recognizes there are many benefits to a conversion for not only motorist, but for pedestrians and bicyclist as well.

CONCLUSION

In conjunction with this report, Charlotte Department of Transportation prepared the North Sharon Amity Road and Castleton Road Safety Report. The report evaluated the need for improvements at Castleton Road and Craig Avenue in comparison to other intersections throughout the City. There are dozens of thoroughfares with similar characteristics to North Sharon Amity Road throughout Charlotte. Current conditions and crash history do not warrant a signal at either location. Instead of pursuing a traffic signal installation out of sequence with higher priorities, CDOT has proactively addressed the community's concerns.

Improvements to date include the installation of two permanent dynamic driver feedback speed signs along North Sharon Amity Road. One sign is placed at the southbound approach to Craig Avenue and the other at the northbound approach to Castleton Road. These devices display individual vehicle speeds in comparison to the speed limit and warn speeding motorist to "slow down." Charlotte Mecklenburg Police Department is also providing additional enforcement along North Sharon Amity Road.

CDOT has also installed intersection ahead warning signs on the northbound and southbound North Sharon Amity Road approaches to Castleton Road. These signs include supplemental plates with "Castleton Rd" under the warning sign. Supplemental plates with "Craig Ave" were added to the existing warning signs on the northbound and southbound North Sharon Amity Road approaches to Craig Avenue. In addition, the street name markers for Castleton Road and Craig Avenue were updated and relocated to more prominent locations to aid in making both intersecting streets more visible to motorist traveling on North Sharon Amity Road. Overgrown vegetation was trimmed at both intersections to provide better sight distance for motorist traveling on either Castleton Road or Craig Avenue.

Since the installation of the above listed improvements, the City has seen a reduction in the number of crashes and severity. The City will continue to monitor both intersections and work with the Charlotte Mecklenburg Police Department to continue their on-going efforts to reduce speeding along North Sharon Amity Road.

APPENDICES

Alternative Analysis Table 1		Signal at Sharon Amity Road (with Left Turn Lanes)	
		Castleton Road	Craig Avenue
Crashes	Left-turn different roadway accidents	Corrects this type of crash for Sharon Amity and side street with signal.	Corrects this type of crash for Sharon Amity and side street with signal
	Right-turn different roadway	Corrects this type of crash	Corrects this type of crash
	Rear end	It will increase rear-end crashes on Sharon Amity	It will increase rear-end crashes on Sharon Amity
	Left-turn same roadway accidents	Corrects this type of crash	Corrects this type of crash
Pedestrians		Enhances pedestrian crossing because traffic will be stopped and pedestrians will have their own signal.	Enhances pedestrian crossing because traffic will be stopped and pedestrians will have their own signal.
Cyclist		* Improves crossing of Sharon Amity Road * Improves left-turns from Sharon Amity Road.	* Improves crossing of Sharon Amity Road. * Improves left-turns from Sharon Amity Road.
Sight Distance		Enhances sight distance for all movements	Enhances sight distance for all movements
Property impacts		* Steep property slopes - longer tie-in point or retaining wall along Sharon Amity * Road closer to properties along Sharon Amity * Impacts to mature trees	* Flat property slopes - shorter tie-in point or less length of retaining wall along Sharon Amity * Road closer to properties along Sharon Amity * Angle of home positions reduce impacts * Impacts to mature trees (possibly fewer than Castleton)
Speed reduction		Reduce speeds because signal will break-up the long segment without a signal.	Reduce speeds because signal will break-up the long segment without a signal.
Estimated Cost		\$2.1M It will be a higher cost than Craig Avenue because of the steep property grades on both sides of Sharon Amity Road requiring some retaining walls or longer tie-in point to existing grade.	\$2M It will be less costly than Castleton intersection because the property grades are flatter making an easier tie-in point.
Estimated Duration of Implementation		5 years	5 years

Alternative Analysis Table 2		Restricted Access	
		Median Restricted Access	Signs Only
Crashes	Left-turn different roadway accidents	Corrects this type of crash because it will not allow these movements from Sharon Amity or the side streets.	Corrects this type of crash because it will not allow these movements from Sharon Amity or the side streets.
	Right-turn different roadway	No Impact	No Impact
	Rear end	It will decrease the rear-end crashes on Sharon Amity for left-turn vehicles but not right-turn vehicles	It will decrease the rear-end crashes on Sharon Amity for left-turn vehicles but not right-turn vehicles
	Left-turn same roadway accidents	Corrects this type of crash because it will prohibit this movement.	Corrects this type of crash because it will prohibit this movement.
Pedestrians		May serve as refuge for pedestrians	May serve as refuge for pedestrians
Cyclist		2 Options: opening for cyclist to cut through but will not be wide enough for staging, or restrict the crossing completely	2 Options: opening for cyclist to cut through but will not be wide enough for staging, or restrict the crossing completely
Sight Distance		*Restriction eliminates left-turn different roadway crashes from side streets.	*Restriction eliminates left-turn different roadway crashes from side streets.
Property impacts		Craig: less impacts because topographic is flat and homes are further away from street. Castleton: more impacts because of steep topographic constraints. Large trees would be removed and homes are closer to the road.	Craig: less impacts because topographic is flat and homes are further away from street. Castleton: more impacts because of steep topographic constraints. Large trees would be removed and homes are closer to the road.
Speed reduction		It will not reduce the speed of vehicles on Sharon Amity	It will not reduce the speed of vehicles on Sharon Amity
Estimated Cost		\$400K-250K Several cost options depending on selected alternative: most expensive staging area for cyclist; medium cost would be incorporating a pedestrian refuge island; least expensive would be to just restrict vehicle movements	\$5K Minimal cost
Estimated Duration of Implementation		3.5 years	3 months

Alternative Analysis Table 3		Neighborhood connectivity	
		Doncaster Drive	Shady Bluff Drive
Crashes	Left-turn different roadway accidents	No direct positive impact (Potentially reduce because people chose a different route)	No direct positive impact (Potentially reduce because people chose a different route)
	Right-turn different roadway	No direct positive impact (Potentially reduce because people chose a different route)	No direct positive impact (Potentially reduce because people chose a different route)
	Rear end	No direct positive impact (Potentially reduce because people chose a different route)	No direct positive impact (Potentially reduce because people chose a different route)
	Left-turn same roadway accidents	No direct positive impact (Potentially reduce because people chose a different route)	No direct positive impact (Potentially reduce because people chose a different route)
Pedestrians		No direct positive impact (Helps overall network connectivity)	No direct positive impact (Helps overall network connectivity)
Cyclist		No direct positive impact (Helps overall network connectivity)	No direct positive impact (Helps overall network connectivity)
Sight Distance		No direct positive enhancements	No direct positive impact
Property impacts		Major grade impacts to adjacent properties because need to raise the road to make the connection.	Impacts adjacent properties but less severe than Doncaster connection because it is not in the flood plain.
Speed reduction		Will not reduce the speed on Sharon Amity Road.	Will not reduce the speed on Sharon Amity Road.
Estimated Cost		\$2M It would be expensive because a culvert is required but would be less expensive than Shady Bluff connection.	\$3M It would be expensive because a culvert is required and it would impact more properties than Doncaster connection.
Estimated Duration of Implementation		4 years	6 years

Alternative Analysis Table 4		Modern Roundabout
		Craig Avenue
Crashes	Left-turn different roadway accidents	Corrects this type of crash (May increase side swaps but are typically fender benders)
	Right-turn different roadway	Corrects this type of crash (May increase side swaps but are typically fender benders)
	Rear end	Corrects this type of crash (May increase side swaps but are typically fender benders)
	Left-turn same roadway accidents	Corrects this type of crash (May increase side swaps but are typically fender benders)
Pedestrians		Enhances pedestrian crossing because crossing will be staged (Crossing two lanes at a time)
Cyclist		* Improves crossing of Sharon Amity * Improves left-turns from Sharon Amity
Sight Distance		Improves sight distance on all movements
Property impacts		*Roundabouts have a very large footprint *2-Lane requires 150' - 260' outside diameter *Need to buy properties at intersections *Impacts to mature trees
Speed reduction		Reduce the speed on Sharon Amity
Estimated Cost		\$3M Very expensive because requires purchasing properties at intersections.
Estimated Duration of Implementation		4.5 years

Alternative Analysis Table 5		Sharon Amity Road Conversion
		Castleton Road / Craig Avenue
Crashes	Left-turn different roadway accidents	Will help left-turns from Sharon Amity but not from the side streets.
	Right-turn different roadway	Will improve because cars will be able to "pull up" and have better sight distance.
	Rear end	It will decrease the rear-end crashes on Sharon Amity for left-turn vehicles but not right-turn vehicles
	Left-turn same roadway accidents	Positive effect on this type of crash. (Adding a median increase improvement)
Pedestrians		Fewer crossing lanes
Cyclist		Fewer crossing lanes
Sight Distance		Would improve sight distance because vehicles on Sharon Amity would be near center of road. Vehicles from side streets will be able to pull up and have better visibility
Property impacts		No property impacts
Speed reduction		May reduce the speed of the vehicles
Estimated Cost		\$325k Minimal cost because road would be resurfaced in the future under normal budget cost.
Estimated Duration of Implementation		1.5 years